

EXAMPLE OF A LABORATORY QUALITY MANUAL

This appendix is designed to provide the contractor with general guidelines in creating and maintaining a contractor's Quality Manual. The QC process requires records for equipment calibrations/verifications. Maintaining records in an orderly manner will assist the District Materials Engineer in quickly determining if the laboratory meets QC/QA requirements. Having the field laboratory fully prepared and the Quality Manual properly maintained represent two items that can keep the start of a project on schedule. It also aids in demonstrating the contractor's commitment to the QC process.

The following records are presented to illustrate what is required in the Quality Manual. Records need not be exactly as illustrated but should supply all necessary information concerning the equipment calibration/verification.

NOTE 1: After calibrating any force-load testing equipment (stability machine, gyratory, etc.) a copy of the certification for the calibration device (proving ring, load cell, etc.) shall be attached to the calibration record.

NOTE 2: All equipment shall be verified immediately after repairs (this may include new or replacement parts, or mechanical or electrical adjustments) that may in any way affect the ability of the equipment to provide accurate readings as established during the calibration/verification process.

DISCLAIMER: It is not the intent of these guidelines to endorse manufacturers, suppliers, calibrating services, etc. The examples are used to provide guidance in establishing a properly equipped Quality Manual.

LABORATORY QUALITY MANUAL
TABLE OF CALIBRATION/VERIFICATION DATES
Revision Date 12/06/04

ITEM	CAL/VER INTERVAL (MONTHS)	NEXT CAL/VER
SIEVES	6	05/06/05
MECH. SIEVE SHAKER	12	11/06/05
THERMOMETER	12	04/29/05
OVENS	4	12/20/04
VACUUM SYS.	12	05/26/05
M/D GAUGE	12	04/19/05
STABILITY MACHINE	12	04/24/05
BALANCES	12	03/30/05
WEIGHTED FOOT	12	10/03/05
GYRATORY	12	12/19/04

July 27, 2005

VERIFICATION PROCEDURE FOR SIEVES
(Page 1/2)

Purpose:

This method provides instructions for checking the physical condition of laboratory tests sieves ranging in size 75 mm (3 in.) to 0.075 mm (#200).

Inspection Equipment Required:

1. A caliper readable to 0.01 mm (use for #4 or coarser).

Tolerances:

Sieves shall meet physical requirements specified in AASHTO M 92 (ASTM E11).

Procedure:

(Steps 1 & 2 apply to sieves having openings greater than 4.75 mm)

1. Select an adequate number of individual sieve openings (3 or 4) along a 45° line. Measure and record the sieve openings to verify that the size opening indicated on the label is correct.
2. Repeat step 1, rotating the sieve 90°.
3. Inspection the general condition of the sieve. Check the frame and solder joints for cracks or holes (check for pin holes in the finer sieves).
4. Make sure the sieves has an appropriate label.
5. Check for tightness of the wires on each individual sieve.

July 27, 2005

VERIFICATION RECORD FOR SIEVES
(Page 2/2)

Inspected by: _____ Date:

Identification No. _____ Verification Frequency:

Previous Verification Date: _____ Next Due Date: _____

Verification Equipment Used: See verification procedure for sieves

Verification Procedure Used: See verification procedure for sieves

Opening Size: Step 1

1. _____ mm

2. _____ mm

3. _____ mm

4. _____ mm

Opening Size: Step 2

1. _____ mm

2. _____ mm

3. _____ mm

4. _____ mm

General Condition of Sieve:

Label Correct: _____ Wires Tight:

Action Recommended: Replace _____ None

Comments:

July 27, 2005

VERIFICATION PROCEDURE FOR MECHANICAL SIEVE SHAKER
(Page 1/2)

Purpose: This method provides instructions for checking the length of time the mechanical sieving device must run to meet the tolerances as specified in KT-2 c.3.

Inspection Equipment Required:

1. Set of 8" dia. sieves (3/8, 4, 8, 16, 30, 50, 100, 200)
2. Timer
3. Balance, readable to 0.1 g.
4. Sample of fine aggregate.

Tolerance:

Shaker shall meet the tolerances specified in KT-2 c.3.

Procedure:

1. Place sample of aggregate in nested sieves.
2. Place sieves in shaker & set timer for 4 minutes.
3. Check sieving adequacy as described in KT-2 f.3.
4. If 4 minute setting doesn't meet specification increase time by 30 seconds intervals until specification is met.

July 27, 2005

VERIFICATION RECORD FOR MECHANICAL SHAKER
(Page 2/2)

Inspected by: _____ Date:

Identification Number: _____ Verification Frequency: 12 months.

Previous Verification Date: _____ Next Due Date: _____

Verification Equipment Used: See Verification Procedure For Mechanical Shaker.

Verification Procedure: See Verification Procedure For Mechanical Shaker.

1. Mass of sample _____ grams.
2. Mass of material passing sieve after 1 minute of hand sieving as described in KT-2 f.2.
3. Percent of material passed.

Comments:

VERIFICATION PROCEDURE FOR THERMOMETERS

(Page 1/2)

FORM DATE: March 29, 2004

Purpose:

This method provides instructions for verifying the settings on general-purpose thermometers.

Inspection Equipment Required:

1. A calibrated thermometer graduated in 1.0°C (2.0°F) increments having a range which includes the temperature range to be checked.
2. A clothes pin to hold the thermometer in such a manner as to enable the operator to read the scale easily.
3. A container well to retain heat for constant temperature readings.
4. A hot plate to heat the liquid (oil) in the container well.

Procedure:

1. Place the thermometer inside the container well with the clothes pin attached to the thermometer.
2. Take the first reading when the temperature has stabilized.
3. Take as many readings as necessary to determine the "laboratory thermometer setting" vs "actual calibrated reading."

VERIFICATION RECORD FOR THERMOMETERS
(Page 2/2)

Specification Interval: 6 months

Model No. see below

Serial No . see below

Date : _____

Calibration/Verification Performed by : _____

Cal./Ver. Procedure Reference: See Verification Procedure for Thermometers

Previous Calibration/Verification Date : _____

Next Calibration/Verification Due Date : _____

Calibration/Verification Equipment Used : _____

Model/Serial No. of C/V Equipment Used : see below

1. Equipment thermometer reading see below

2. Calibrated thermometer reading see below

Equipment Thermometer Designation	Equipment Thermometer Reading	Calibrated Thermometer Designation	Calibrated Thermometer Reading
---	-------------------------------------	--	--------------------------------------

VERIFICATION PROCEDURE FOR OVENS

(Page 1/2)

Form Date: March 29, 2004

Purpose:

This method provides instructions for verifying the accuracy of the temperature settings and the tolerance on ovens.

Inspection Equipment Required:

1. A calibrated thermometer graduated in 1.0°C (2.0 °F) increments having a range that includes the temperature range to be checked.
2. A brass thermometer well to retain heat while the oven door is open. This is essential for a constant temperature reading.
3. A clothes pin to hold the thermometer in such a manner as to enable the operator to read the scale easily from outside or inside the oven.

Tolerance:

Drying ovens shall be capable of maintaining a constant temperature range listed in the appropriate test methods.

Procedure:

1. Place the thermometer inside the brass well with the clothes pin attached to the thermometer. Position the thermometer on the shelf where the samples are normally dried.
2. Take the first reading at least 1 hour after closing the oven (oven should remain undisturbed).
3. Take as many readings as necessary to determine if the temperature range is within the specified tolerance (three consecutive readings, taken no less than 1/2 hr apart, within tolerance allowed are adequate).
4. Adjust the temperature of the oven if an observed temperature reading is outside the tolerance specified (allow at least 1/2 hr for the temperature to stabilize between each adjustment). Return to step 3.

Form Date 03/31/2004

VERIFICATION RECORD FOR OVENS
(Page 2/2)

Verified by _____ Date _____

Verif. Frequency 4 month

Identification No.: _____

Prev. Verif. Date: _____ Next Due Date : _____

Verif. Equip. Used Cal. Therm. Verif. Procedure Verification Procedure for Ovens

Temperature Range

Temperature*	Oven Dial Reading	Correction Factor

Action Recommended: Repair ____ Replace ____ None X

*This thermometer has been tested by comparison with standards certified by NIST. If the correction is “+” the true temperature is higher than the thermometer reading. If the correction is “-” the true temperature is lower than the thermometer reading

VERIFICATION PROCEDURE FOR VACUUM SYSTEM

(Page 1/2)

Form Date: April 20, 2004

Purpose:

This method provides instructions for checking the vacuum pressure.

Inspection Equipment Required:

1. Absolute pressure gauge or manometer.
2. Water vapor trap.
3. Hoses, connectors, tools, misc.

Tolerance:

Equipment shall be capable of applying the vacuum specified in the applicable test method (usually 30mm Absolute Vacuum)

Procedure:

1. Connect the gauge to the system with the trap in-line between the system and the gauge.
2. Make sure all connections are air-tight.
3. Open the number of lines normally used in testing, then read and record the pressure indicated on the gauge.

3/23/1995

VERIFICATION RECORD FOR VACUUM SYSTEM
(Page 2/2)

Verified By _____ Date 4/26/2004

Verif. Frequency 12 MONTHS

Identification No. MODEL # *****

Previous Verif. Date 04/20/2003 Next Due Date 4/26/2005

Verif. Equip. Used ABSOLUTE GAUGE Verif. Procedure: Verificationn Procedure for Vac. Sys.

Vacuum 15mm of Hg vacuum is available at the end of the vacuum line

Action Recommended: Repair ____ Replace ____ None x

Comments: Replaced diaphragm and reed valves(both heads). 4-24-2004

MOISTURE/DENSITY GAUGE CALIBRATION

Troxler Electronic Laboratories, Inc.

Page 1/2

Gauge model -3440
Serial-19627

Ref standard count:density - 2365.525
moisture- 686.05

Source type- Cs-137 Am-241/Be
Serial- 50-09352 47-15173

Calib date: 3-19-2004 Bay-4
Print date: 3-19-2004

*** Density calibration count data ***

Depth	Magnes	Mag/Al	Alumin
	1784.0	2217.0	2715.0
-----	-----	-----	-----
BS	1061	700	482
2	3662	2311	1467
4	3754	2227	1310
6	3020	1665	911
8	2083	1062	533

*** Density performance parameters ***

Pos	A	B*1000	C	'Y'	Slope	Prec
---	-----	-----	-----	-----	-----	-----
BS	4.930	1.52416	-0.11248	2217.0	0.8	8.51
2	16.750	1.44684	-0.24045	2217.0	3.2	4.15
4	21.332	1.54070	-0.17553	2217.0	3.6	3.67
6	24.074	1.72200	-0.11952	2217.0	3.1	3.67
8	22.955	1.89212	-0.06308	2217.0	2.3	3.99

*** Moisture calibration count data ***

Mag	Mag/poly	S R
0.0	553.0	
---	-----	---
20	406	398

Moisture performance parameters ***

E	F*1000	Rat	Prec	S R	Exerr
-----	-----	----	----	---	----
0.02915	1.01743	3.21	5.00	-11.5	12.6

Density Standard Decay Sheet

Gauge model -3440
Serial-19627

Calib date: 3-19-2004
Print date: 3-19-2004

Ref. std. cnt. 2365.525

Range of projected density standard counts at future dates

Date	Lower Limit of Projected density Standard Count	Upper Limit of Projected density Standard Count
-----	-----	-----
04-01-1996	2340	2387
05-01-1996	2336	2383
06-01-1996	2331	2378
07-01-1996	2327	2374
08-01-1996	2322	2369
09-01-1996	2318	2364
10-01-1996	2313	2360
11-01-1996	2309	2355
12-01-1996	2304	2351
01-01-1997	2300	2346
02-01-1997	2295	2342
03-01-1997	2291	2338
04-01-1997	2287	2333

STABILITY MACHINE

Proving Ring Calibration Certificate

SATEC Materials Testing Equipment

SATEC Systems, Inc.
900 Liberty Street
Grove City, PA 16127-9005
1-800-728-8378

Report and Certificate of Verification

This is to certify that the following described machine has been verified in accordance with ASTM E4-89 and was found to be within a tolerance of +/- 1.0 %.

Location: Kansas Dept. of Transportation
2300 Van Buren Street
Topeka, KS 66611

Machine: Reinhart
Model: Compression Tester
Serial No: BLH #56284

Mode of Verification: Compression
Next Verification Due: 04/24/97

Attn: Larry Schroeder

Range Verified: 1000 to 10000 Lbs.

Machine Reading	Device Reading	Machine Error		C.D. Code
		Unit	%	
1000	997	3	0.33	2
2000	1999	1	0.05	3
4000	3989	11	0.28	3
6000	5954	46	0.78	3
8000	7937	63	0.79	3
10000	9924	76	0.77	3

Range Verified: 500 to 5000 Lbs.

Machine Reading	Device Reading	Machine Error		C.D. Code
		Unit	%	
500	498.8	1.2	0.28	1
1000	1007.5	-7.5	0.74	2
2000	2005.0	-5.0	0.25	3
3000	2996.4	3.6	0.12	3
4000	3979.4	20.6	0.52	3
5000	4992.2	7.8	0.16	3

Range Verified: 250 to 2500 Lbs.

Machine Reading	Device Reading	Machine Error		C.D. Code
		Unit	%	
250	249.46	0.54	0.21	1
500	500.24	-0.24	0.05	1
1000	1001.27	-1.27	0.13	2
1500	1497.33	2.67	0.18	3
2000	1991.80	8.20	0.41	3
2500	2501.67	-1.67	0.07	3

Range Verified: to

Machine Reading	Device Reading	Machine Error		C.D. Code
		Unit	%	

LOAD VALUES CORRECTED FOR A TEMPERATURE OF
72 DEGREES FAHRENHEIT.

Verification Method Used:

X Follow-the-Force Method

Set-the-Load Method

Load Indicating Device Mfg. Strainsense

Device Serial Number: 920902

Load Indicating Device Verified: 04/19/95

SATEC Verification Equipment Information:

C.D. Code	Serial Number	Manufacturer	Verification High Value	Loading Range Class A Value	Calibration Date	Calibration Agency Laboratory Number
1	950411A	STRAINSSENSE	600	34.35	04/21/95	BJT 01/106121
2	920902B	STRAINSSENSE	9000	525.6	04/19/95	BJT 01/106121
3	920902C	STRAINSSENSE	20000	1040	04/25/95	BJT 01/106121
4	920902D	STRAINSSENSE	120000	8320	04/26/95	BJT 01/106121
5	920902F	STRAINSSENSE	600000	16760	07/06/94	BJT 01/106099
6	8990	RICE LAKE - Weights	50	0.01	03/17/92	NIST 781/24597
7						

Method of verification and pertinent data in accordance with ASTM Specification E4-89 and SATEC Systems, Inc. "Procedure for Calibration Tension and Compression Testing Machines." The Testing Device(s) used for this verification have been calibrated per ASTM Specification E74 and are traceable to the National Institute of Standards Technology.

Date of Verification: 04/24/96

Verified By:

Witness: _____

Richard J. Hestelberger
Service Engineer - Satec Systems, Inc.

CALIBRATION OF BALANCES

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March 30, 2004

ALFIE PACKERS INC.

SCOPE OF WORK FOR LABORATORY BALANCES:

Definitions are on next page.

1. The weighing environment is checked for anything that would effect the ability of the balance to weigh accurately for example: direct air currents, direct sunlight, objects stuck under the balance or magnets in close proximity to the balance.
2. The balance is checked for errors in zero, sensitivity, calibration, corner load, linearity, repeatability and tare accuracy. Any errors are noted.
3. The balance is thoroughly cleaned and disassembled. Parts subject to wear or damage are inspected. On mechanical balances, this includes but is not limited to knife edges, arrestment mechanism, switches, pan brake assemblies and weight lifting assemblies. On electronic balances, the measuring cell and flexures are inspected. Circuit boards and switches are inspected for contamination and corrosion.
4. Any errors noted in step two are corrected through adjustments or replacement of minor parts. If the balance cannot be returned to factory specifications through this method, the using personnel are consulted as to the need for further repairs.
5. The balance is reassembled and final checks are made as in step two. Final calibration adjustments are made.
6. Applicable GLP log books are annotated.
 - A. All tests are performed with Class 1 stainless steel weights traceable to the NIST and are calibrated at least annually.
 - B. A certificate of weight traceability to the NIST is provided to each functional area. This certificate lists all the balances serviced in that area and the serial number of the weights used, their calibration date, the NIST trace number and the technician calibration number.

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DEFINITIONS:

Balance = Weighing device, generally with a resolution of 1 part in 12,000 or greater. Top loading balances will have a resolution of up to 1 part in 1,200,000 and sensitivity down to 1 milligram i.e. 1200.000 gram +/- .001 gram. Analytical balances will have a resolution of up to 1 part in 4,100,000 and sensitivity down to .01 milligram i.e. 41.00000 gram +/- .00001 gram. Micro-balances will have a resolution of up to 1 part in 200,000,000 sensitivity down to .0000001 gram.

Calibration = The accuracy of the balance, usually at full capacity, as compared to known standards.

Class 1 = A published standard for weights from the NIST. The standard dictates the materials, configuration and tolerance of the weights.

Corner loads = The deviation of the indicated weight between the center of the pan and the front, rear, left and right of the pan. This test is performed at 2/3 of maximum capacity.

Electronic Balance = A balance deriving its indicated weight from a force restoration coil measuring cell or high resolution load cell.

Factory specifications = The balance manufacturers specifications for all adjustments, usually +/- 1 final count (least significant digit).

Flexure = Parts of the measuring cell. The accuracy of all adjustments is dependent on the condition of these parts.

GLP = Acronym. Stands for Good Laboratory Practices. Laboratories under this standard must establish a plan for weighing accuracy control.

Knife edges = The pivot points of the balance beam in mechanical balances.

Mechanical Balance = A high resolution balance deriving its indicated readout from the mechanical movement of a balance beam and a system of built in standard comparison weights.

NIST = Acronym. Stands for the National Institute for Standards and Technology. This is the new name for the National Bureau of Standards (NBS).

Pan brake = Part of a mechanical analytical balance used to stop pan swing when the balance is arrested.

DEFINITIONS, CONTINUED

Repeatability = Test performed on all balances to determine if it indicates the same weight and returns to zero every time a weight is applied to and removed from the pan. This test is normally performed with a weight that is near the normal usage of the balance if known or near the mid-range of the balance. The weight is placed on the balance a minimum of three times to get a plus or minus reading.

Sensitivity = On mechanical balances this test determines the accuracy of the beam travel or optical range of the balance. On electronic balances this is the lightest weight that the balance will accurately respond to.

Tare accuracy = This test is used on mechanical balances to determine if the balance reads the same with or without the tare.



Certificate of Weight Traceability

To: KANSAS DEPARTMENT OF TRANSPORTATION
2300 VAN BUREN TOPEKA KANSAS

The following balances have been calibrated on SEE BELOW

Service representative: M. J. Gorman

Balance	Serial Number	
<u>3/17/95 OHAUS E4000I</u>	<u>2274</u>	<u>Agg,</u> <u>CONCRETE</u>
<u>3/17/95 METTLER P10</u>	<u>192446</u>	<u>Agg</u> <u>CONCRETE</u>
<u>3/17/95 A&D FW-100KA1</u>	<u>05707023</u>	<u>CONCRETE</u>
<u>3/17/95 A&D EP-6000</u>	<u>6401205</u>	<u>METALS</u>
<u>3/17/95 SARTORIUS I8100P</u>	<u>40210240</u>	<u>Cement</u> <u>CONCRETE</u>
<u>3/27/95 SHIMADZU AEG-220</u>	<u>D400400181</u>	<u>Cement</u> <u>CONCRETE</u>
<u>3/27/95 A&D EP-20KB</u>	<u>3808903</u>	<u>Agg,</u> <u>CONCRETE</u>
<u>3/27/95 A&D EP-20KB</u>	<u>3809190</u>	<u>Agg,</u> <u>CONCRETE</u>

Serial number of mass standards:

E136/AP-9M04/AP-9W04/AP-9P04/AP-9Q94

Calibration date: MAY 4, 1994 / SEPTEMBER 26, 1994

NIST test number: 732/246308/94-0107

State certification number: 5146-141 KS.

Date of issue: 2/30/95

Alfie Packers Inc.
8901 J Street
Omaha Ne. 68127
402-592-9102

VERIFICATION PROCEDURE FOR SAND EQUIVALENT
(Page 1/2)

(DATE)
10-03-04

Equipment Checked: WEIGHTED FOOT ASSEMBLY

Purpose:

This method provides instructions for verifying the critical mass of the weighted foot assembly.

Inspection Equipment Required:

1. Balance, capacity 6100 g, readable to 0.1 g, repeatability to 0.05 g.

Tolerance:

Equipment shall meet the mass tolerances specified in the applicable test method.

Procedure:

1. Place the weighted foot assembly on the scale.
2. Record the mass to the nearest 0.1 g.
3. The mass shall be 1000 ± 5 g.

VERIFICATION RECORD FOR SAND EQUIVALENT

Page 2/2

The only item to be systematically inspected for KT-55 is the weighted foot assembly. The assembly is to be inspected annually. The assembly is to have a mass of 1000 ± 5 g and shall be verified on calibrated scales.

Information concerning KT-55 is as follows:

1. Model and Serial Number.

2. Name of worker.

3. ID of Calibration/Verification (C/V) equipment used.

Serial Number _____
Maximum Load _____g
Readability 0.1 g

4. Date of work done.

5. Next Due Date.

_____ (12 month check)

6. Previous C/V date.

New Equipment

7. Detailed results.

The mass of the weighted foot was _____ grams.

8. Reference to procedure used.

See Page 2/2.

CAL/VER PROCEDURE FOR GYRATORY

(Page 1/4)

Purpose:

This method provides instructions for calibrating the load (pressure) and verifying the angle, rotation and height on the Superpave Gyratory. Use the proper equipment designated by the manufacturer when calibrating or verifying the Gyratory.

Inspection Equipment required:

A certified load cell or proving ring to calibrate the load readings. Digital stopwatch required to determine the rotational speed. Manufacturer's recommended equipment for determining proper angle. Certified blocks for determining accuracy of height reading.

Tolerances:

Meet all requirements as specified:

Gyratory:

Capable of applying a pressure of 600 ± 6 kPa

Capable of applying an angle of 1.16 ± 0.02 degrees

Gyrates specimen molds at 30 ± 0.5 rev./minute

Records height of specimen to 0.05 mm during compaction once per gyration

Molds - 150 mm (nominal 6 in):

Inside diameter of molds 149.90 to 150.00 mm

At least 250 mm high

Walls at least 8.5 mm thick

Ram base and base plate faces shall be ground flat and have a diameter of 149.70 to 149.75 mm

Molds - 100 mm (nominal 4 in):

Inside diameter of molds 99.90 to 100.00 mm

At least 250 mm high

Walls at least 8.5 mm thick

Ram base and base plate faces shall be ground flat and have a diameter of 99.70 to 99.75 mm

Procedures:

Follow the calibration procedures set forth in the manufacturer's manual to meet the tolerances established above.

CAL/VER RECORD FOR GYRATORY
(Page 2/4)

Inspected by: _____ Date: _____

Identification Number: _____ Verification Frequency: 12 months.

Previous Verification Date: _____ Next Due Date: _____

Verification Equipment and Procedure Used: See Manufacturers Manual.

Calibration Results:

Angle Set at: _____

Revolutions Per Minute : _____

Height at aspecific loaction :

	Actual (mm)	Gyratory (mm)	% Error (\pm 0.05 mm)
1 .	_____	_____	_____
2 .	_____	_____	_____
3 .	_____	_____	_____

Load at 3 (minimum) specific locations:

	Actual (N/lbs)	Gyratory (N/lbs)	% Error = $\frac{100 (\text{Gyratory} - \text{Actual})}{\text{Actual}}$
1 .	_____	_____	_____
2 .	_____	_____	_____
3 .	_____	_____	_____
4 .	_____	_____	_____
5 .	_____	_____	_____

VERIFICATION OF INSIDE DIAMETERS FOR GYRATORY MOLDS
(Page 3/4)

Verified By: _____ **Date:** _____

Equipment: Gyratory Compaction Molds **Verif. Frequency:** 12 Months

Equipment Identification: _____ See Below

Previous Verif. Date: _____ **Next Due Date:** _____

Verification Equipment Used: _____

Verif. Equipment Identification: _____

Verif. Procedure Used: _____

Tolerance of Molds:	5.902 to 5.906 in (149.90 - 150.00 mm)
----------------------------	--

Bore Gauge Readings:	
-----------------------------	--

Mold Number <u>1</u>					
Orientation	Reading 1	Reading 2	Reading 3	Ave. of Readings	Average Diameter
Top					
Middle					
Bottom					

Average Inside Diameter: _____

Action Recommended: Repair ☐ Replace ☐ None ☐

Comments _____

Mold Number <u>2</u>					
Orientation	Reading 1	Reading 2	Reading 3	Ave. of Readings	Average Diameter
Top					
Middle					
Bottom					

Average Inside Diameter: _____

Action Recommended: Repair ☐ Replace ☐ None ☐

Comments _____

CAL/VER RECORD FOR GYRATORY
(Page 4/4)

Proving Ring Calibration Certificate

Certificate of Calibration
and Traceability to the
United States National Institute of Standards & Technology

Pine Instrument Company
10,000 lbf Capacity Proving Ring
Serial No.: 1306

The above identified instrument was calibrated as a limited load instrument according to ASTM specification E74-91, "Standard Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines."

Following are the units and loads of force applied to the instrument during three separate calibration runs, the deflection in divisions as read on the indicator for each applied load, and the average deflection in divisions for each load.

Applied Load LBF	Compression Mode Indicator Readings			Average DIV
	Run 1 DIV	Run 2 DIV	Run 3 DIV	
0	0.0	0.0	0.0	0.0
350	35.0	35.0	35.0	35.0
500	50.0	50.0	50.0	50.0
1000	100.0	100.0	100.0	100.0
1500	149.0	149.0	149.0	149.0
2000	199.5	199.5	199.5	199.5
2500	250.0	250.0	250.0	250.0
3000	300.0	300.0	300.0	300.0
4000	403.5	403.0	403.0	403.2
5000	507.0	507.0	507.0	507.0
6000	608.5	608.0	607.5	608.0
7000	714.5	714.0	714.0	714.2
8000	817.0	817.0	816.5	816.8
9000	921.0	920.5	920.5	920.7
10000	1028.0	1027.5	1026.0	1027.8

Temperature During Calibration: 22 ° C Calibration Date: 8/17/85
Humidity: 38 % Recalibration Date: 8/18/86
Uncertainty of Standard: +/- 0.02% Due Date: 12/19/86
Standard Used: 10K LB. LOAD CELL S/N 77107
NIST No.: 822.07/250325

Approved By: MPC

Signature of Captain